

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER Bhatoolaul 8-21-7
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5 09/936102
INTERNATIONAL APPLICATION NO. GB99/04179	INTERNATIONAL FILING DATE 10 December 1999	PRIORITY DATE CLAIMED 18 March 1999
TITLE OF INVENTION Improved Message Access for Radio Telecommunications System		
APPLICANT(S) FOR DO/EO/US David Lahiri Bhatoolaul, Qiang Cao, Seau Sian Lim		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.		
2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.		
3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.		
4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).		
5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))		
a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).		
b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.		
c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).		
6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).		
a. <input type="checkbox"/> is attached hereto.		
b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).		
7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))		
a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).		
b. <input type="checkbox"/> have been communicated by the International Bureau.		
c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.		
d. <input type="checkbox"/> have not been made and will not be made.		
8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).		
9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).		
10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).		
Items 11 to 20 below concern document(s) or information included:		
11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.		
12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.		
13. <input type="checkbox"/> A FIRST preliminary amendment.		
14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.		
15. <input type="checkbox"/> A substitute specification.		
16. <input type="checkbox"/> A change of power of attorney and/or address letter.		
17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1 821 - 1 825		
18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).		
19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).		
20. <input type="checkbox"/> Other items or information:		

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21. ☐ The following fees are submitted:**BASIC NATIONAL FEE** (37 CFR 1.492 (a) (1) - (5)):Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO. \$1000.00International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO \$860.00International preliminary examination fee (37 CFR 1.482) not paid to USPTO
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but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY**

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS **NUMBER FILED** **NUMBER EXTRA** **RATE**

Total claims 4 - 20 = 0 x \$18.00 \$ 0

Independent claims 2 - 3 = 0 x \$80.00 \$ 0

MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$270.00 \$ 0

TOTAL OF ABOVE CALCULATIONS = \$ 860.00☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above
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SUBTOTAL = \$ 860.00Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
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TOTAL NATIONAL FEE = \$ 860.00Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

40.00

TOTAL FEES ENCLOSED = \$ 900.00Amount to be
refunded:

\$

charged:

\$

- a. ☐ A check in the amount of \$ _____ to cover the above fees is enclosed.
- b. ☒ Please charge my Deposit Account No. 12-2325 in the amount of \$ 900.00 to cover the above fees.
A duplicate copy of this sheet is enclosed.
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overpayment to Deposit Account No. 12-2325. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. Credit card
information should not be included on this form. Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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SIGNATURE

Claude R. Narcisse

NAME

38979

REGISTRATION NUMBER

09/93610

- 1 -

WO00/56096

PCT/GB99/04179

IMPROVED MESSAGE ACCESS FOR
RADIO TELECOMMUNICATIONS SYSTEM

This invention relates to an improved message access arrangement for a radio telecommunications system such as Universal Mobile Telecommunications System (UMTS) and relates especially to the selection of preamble signatures.

During the set up of a call from a mobile telephone to the UMTS system, a mobile needs to select a preamble signature from the available signatures; subsequently, while waiting for an acquisition indication, the mobile may reselect a signature. It may occur that the mobile selects a signature associated with a stalled state, or that collisions occur, and call connection is delayed.

In WO98/18280 Ericsson, there is disclosure of a mobile telecommunication system in which each mobile requesting access can transmit one of a number of different preamble bit or signal patterns, referred to as "signatures", stored in an internal memory location. The mobile selects one of the stored signatures randomly. However, the arrangement does not address the issue of avoiding stalled states or collisions.

It is an object of the invention to improve the efficiency of signature selection by a mobile.

According to the invention a mobile telephone for the universal radio mobile telecommunication system comprises a processor, a transmitter/receiver, and an antenna, arranged, during call set-up, to transmit an access packet to a base station, said packet comprising a preamble including one of a plurality of available preamble signatures previously obtained from the base station and stored by the mobile, characterised in that the processor is arranged, when the mobile is in an active mode to monitor the acquisition indication channel of the UMTS; to store for the duration of the active mode the usage by other mobiles of each available preamble signature; and to select when required a signature the recorded usage of which is unlikely to cause collisions.

In the accompanying drawings, the prior art is illustrated in figures 1 - 7 in which:-

Figure 1 is a schematic diagram of a part of a radio telecommunications system;

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Figure 2 illustrates a physical random access channel slots structure;
Figure 3 illustrates the structure of a random access transmission;
Figure 4 illustrates the structure of an access burst from a mobile;
Figure 5 illustrates the message part of the random access burst;
Figure 6 illustrates the layers involved in message acknowledgement and
Figure 7 illustrates how random access acquisition indication and forward access
channels interact to acknowledge preamble and message signals from a mobile.

The invention will be described with reference to Figure 8, which is a flow chart
in a mobile system for signature selection.

In Figure 1, a part 10 of the UMTS is illustrated, comprising a plurality of mobile systems (MS) 12, 14, 16 associated with a telecommunications cell controlled by a Base Transceiver Station (BTS) 18 having a Base Station Controller (BSC) 20.

- 5 When a mobile such as 12 wishes to make a call, it utilises the Random Access Channel (RACH) of the UMTS which is mapped to the Physical Random Access Channel (PRACH). Transmission in this transport channel is based on the well known slotted Aloha approach, that is, a mobile can start a transmission of the PRACH at any one of a number of well defined time offsets, denoted access slots AS and illustrated in
- 10 Figure 2. The slots are spaced 1.25 milliseconds apart. Several of the slots in Figure 2 are shown as filled by random access transmissions 30, 32, 34, 36.

- Figure 3 illustrates the structure of a Random Access Transmission such as transmission 30; there are several preamble parts 40a, 40b, 40i, each of length 1 millisecond, and an access burst 42 which contains the preamble part, plus a message
- 15 part of length 10 milliseconds.

- Figure 4 shows the structure of the access burst 42. Between a preamble 40j and the message part 44 there is an idle time period of length 0.25 milliseconds. This idle period allows for detection of the preamble part and subsequent online processing of the message part.

- 20 Figure 5 shows that the RACH message part 44 consists of a data part 46, corresponding to the uplink Dedicated Physical Data Channel (DPDCH) and a Layer 1 control part 48, corresponding to the uplink Dedicated Physical Control Channel (DPCCH). The data and control parts 46, 48 are transmitted in parallel.

- The data part 46 carries Layer 2/Layer 3 messages requesting radio resources or
- 25 a user packet. The spreading factor of the data part is limited to $SF_{\{256,128,64,32\}}$ corresponding to channel bit rates of 16, 32, 64 and 128 Kbps respectively. The control part 48 carries pilot bits 50 and rate information 52, using a spreading factor of 256. The rate information indicates a spreading factor of the channelisation code which is used on the data part.

- 30 For RACH transmission, the technique of preamble power ramping is used, and the procedure used by a random request has the following actions:-

- 1 After cell search and synchronisation, the mobile 12 reads the Broadcast Control Channel (BCCH) (not illustrated) to get information about
- i the preamble spreading code(s)
 - ii the available signatures
 - 5 iii the available access slots
 - iv the available spreading factors for the message part
 - v the uplink interference level in the cell
 - vi the primary CCPCH (Common Control Physical Channel) transmit power level
- 10 2 The MS selects a preamble spreading code and thus the message scrambling code.
- 3 The MS selects a preamble signature and uses it to determine the primary node
- 15 of the channelisation codes used by the message part of the access burst.
- 4 The MS selects a channelisation code (corresponding to a spreading factor) for the message part.
- 20 5 The MS estimates the downlink path loss (by using information about the transmitted and received power level of the primary CCPCH), and determines the required uplink transmit power (by using information about the uplink interference level in the cell).
- 25 6. The MS implements the dynamic persistence algorithm by:
- Reading the current dynamic persistence value from the BCH.
 - Performing a random draw against the current dynamic persistence value.
 - Deferring transmission for one frame and repeating step 6 if the result of the random draw is negative, otherwise proceeding to step 7.
- 30 7. The MS randomly selects an access slot from the available access slots.

8. The MS transmits its preamble at a negative power offset relative to the estimated uplink transmit power. This is illustrated at reference 60 in Figure 7.
- 5 9. The MS waits for an acquisition indication (on the AICH) from the network side. If none is received within a predefined time-out period, the MS transmits the preamble again but with a smaller power offset and a re-selected preamble signature, reference 62, showing the higher power.
- 10 10. Step 8 is repeated, reference 64, showing a further increase in power, and an acquisition indicator 66 is received from the network side that indicates the acceptance by the network side of the preamble at that power offset. The acquisition indicator 66 is received on the AICH.
- 15 11. If an acquisition indicator is received on the AICH in Step 9, the random access burst is transmitted in the next available access slot. This burst comprises a repeated preamble 64A and a message 68.
- 20 12. If the message 68 is corrupted, as indicated by the dotted lines, then there is no positive acknowledgement and actions 1 to 11 are repeated, references 70 to 78; message 78 is successfully received, and an acknowledgement 80 is sent from the network on FACH.

It is clear that the MS 12 selects a preamble signature in action 3, and often reselects a preamble signature in action 9. Each selection may suffer from collisions or the selection of a preamble signature used by a stalled state.

Referring now to Figure 8, which illustrates the inventive method, in step 1 the MS, such as MS 12, is activated. In step 2, MS 12 reads the BCH, and in step 3 records the available signatures in its processor. In step 4 the MS 12 reads the AICH; when the BTS 18 sends an acquisition indication to another mobile, MS 12 records this usage of a particular signature in its processor (step 5).

30

The processor of the MS stores a set of preamble signatures available to the MS. If a signature is in use by a stalled state it is indicated as not available. Of the available signatures, the store records the usage count of each signature. The signatures are divided into relatively high and relatively low usage counts. The MS randomly
5 selects one of the relatively low usage count signatures which is not indicated as unavailable due to use by a stalled state at step 6 or step 9.

Step 6 corresponds to action 3 above. Before selecting a preamble signature, the MS 12 checks its store and randomly selects from a set of preamble signatures which have a low usage count and are not used by any stalled state. The usage count of
10 each preamble signature is refreshed by triggering, eg when the available preamble signatures change on the broadcast channel. It then performs the rest of action 3 and proceeds to action 4 etc. Simultaneously, in step 7, the MS 12 continues to read the AICH and in step 8 records any further acquisition indicators for other mobiles.

Step 9 corresponds to action 9 above. Before reselecting a preamble signature,
15 the MS 12 checks its store and selects randomly a signature from a set of preamble signatures with the lowest usage count and which are not being used by any stalled state. The reselection step may be repeated. In step 10, the MS 12 sends its message, and in step 11 it is deactivated as the call terminates.

By application of the invention, the knowledge of the usage status for each
20 available preamble signature allows a reduction in the number of unsuccessful preamble detections by the BTS 18, and reduces the unsuccessful decoding of messages by the BTS. Over all, the usage efficiency of the RACH is improved.

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CLAIMS

1. A mobile telephone for the universal radio mobile telecommunications system comprising a processor, a transmitter/receiver, and an antenna, arranged, during call set-up, to transmit an access packet to a base station, said packet comprising a preamble including one of a plurality of available preamble signatures previously
5 obtained from the base station and stored by the mobile, characterised in that the processor is arranged, when the mobile is in an active mode (1) to monitor (2) the acquisition indication channel of the system; to store (3) for the duration of the active mode the usage by other mobile telephones of each available preamble signature; and to select (6 or 9) when required a signature the recorded usage of which is unlikely to cause collision].
10
2. A mobile telephone according to Claim 1 in which, for selection of a preamble signature for the determination of the primary node of the channelisation codes used by a message part of an access burst from the mobile, the mobile telephone selects (6) a signature indicated in its store as being unused by another mobile (?)
15
3. A mobile telephone according to Claim 1 or Claim 2 in which, for reselection of a preamble signature, the mobile telephone selects (9) a signature indicated in its store as being least used by other mobile telephones.
20
4. A method of operation, in a radio mobile telecommunications system comprising a plurality of mobile telephones (12, 14, 16) and a base transceiver station (18) providing an acquisition indication channel, in which
25 each mobile telephone obtains from the base station a plurality of available preamble signatures and stores said signatures;
during call set-up, a mobile transmits an access packet to the base station including one of said signatures,
characterised in that :-
each active mobile monitors (2) the acquisition indication channel for usage by

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other mobile telephones as available preamble signatures, and stores (3) said usage; and
each mobile selects when required a signature the recorded usage of which is unlikely to cause collisions.

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FIG. 1

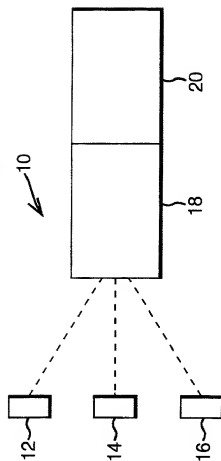


FIG. 2

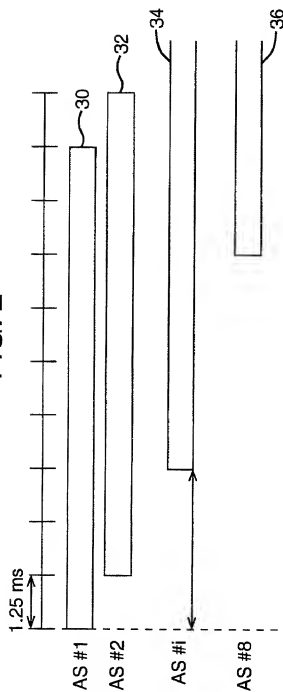


FIG. 3

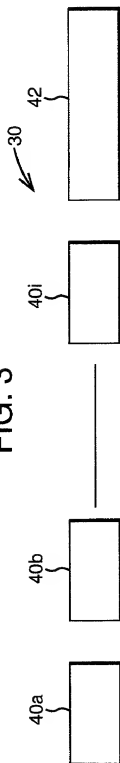


FIG. 4

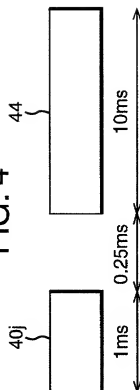


FIG. 5

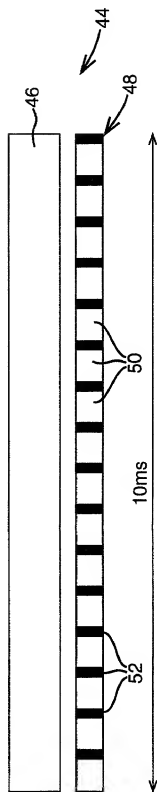


FIG. 6

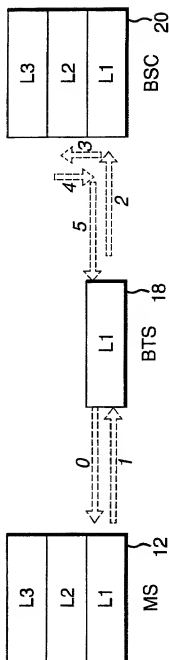


FIG. 7

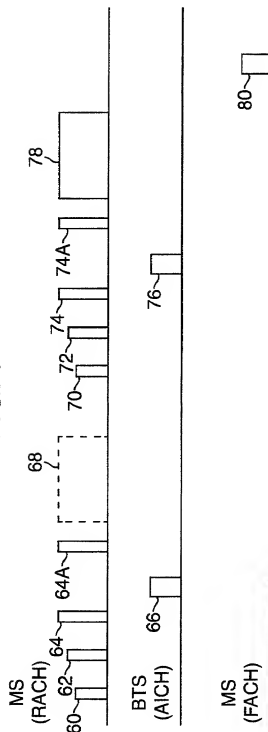
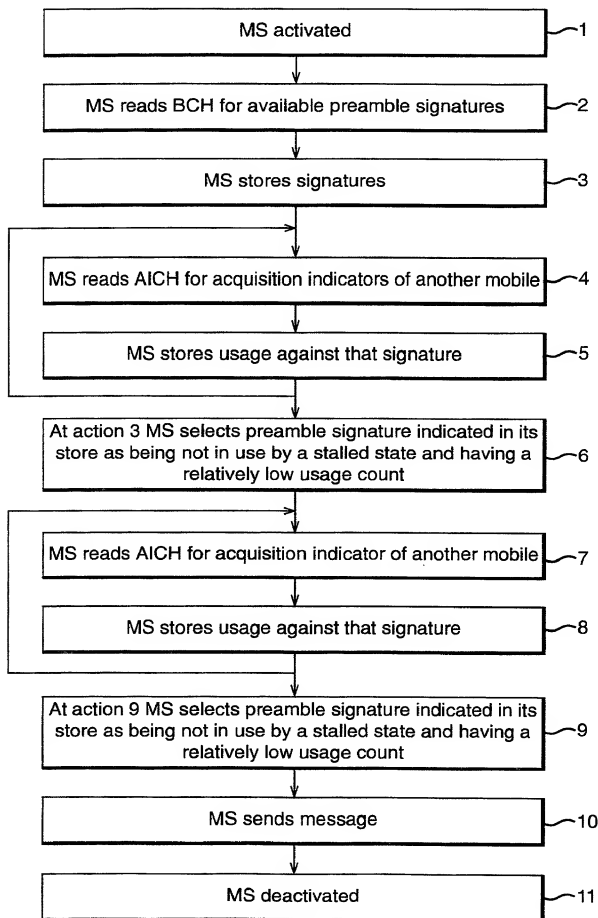


FIG. 8 4/4



IN THE UNITED STATES
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Declaration and Power of Attorney

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **Improved Message Access For Radio Telecommunications System** the specification of which

[] is attached hereto

OR

[] was filed on _____ and granted Application Serial Number _____.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

GB Application No. 9906198.8 filed 18 March 1999

I hereby claim the benefit under Title 35, United States Code, 120 of any foreign application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

**International
Application No.**
PCT/GB99/04179

Date filed
10th December 1999

Status
Pending

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby authorize these attorneys to insert in the above blanks the filing date and application serial no. when known.

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